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Climate Change in the Zambian Mind: Communicating Risk Perception of Climate Change and Variability in Zambia

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No environmental issue has been of such truly global magnitude as the issue of climate change. And no other global environmental issue has been so controversial, not because of lack of scientific knowledge, but rather because it is a result of every human action and will have a direct impact on all human endeavour everywhere. We assessed whether Zambians perceive climate change as a significant threat and whether their risk perceptions of climate change influence their awareness of the degradation of the environment. The paper also examines the affective images Zambians have of global warming and whether these images can influence individuals' behaviour to mitigate global warming. The mean image affect for the most salient image association of global warming was – 4.60 (SD = 4.36); demonstrating that global warming has primarily negative connotations for Zambians. The results indicate that greater perception of the severity of climate change problems cause respondents to be more aware of the degradation of the environment ($\beta = 0.56$, $p < .001$). The results also indicate that respondents with higher risk experience and perception prefer the risk management policies. The result further indicates that the more the respondents experienced the environmental risks, the higher they perceived the risks. Respondents also felt that environmental education strategies were very important in changing public behaviour to reduce the environmental risks. The fundamental claim of this paper, however, is that better environmental information dissemination, more environmental knowledge, or more environmental communication alone will not necessarily lead to desirable social change. While we strongly believe that better understanding has an important role to play, environmental knowledge that does not keep barriers to behaviour and social change in mind is unlikely to be effective or sufficient. Successful environmental policies that mobilize action on climate change education therefore, must take into account the options that people have for action and their social and cognitive characteristics.

Background to the study

No environmental issue has been of such truly global magnitude as the issue of climate change (IPCC, 2001; Olofsson, 2007). And no other global environmental issue has been so controversial, not because of lack of scientific knowledge, but rather because it is a result of every human action and will have a direct impact on all human endeavour everywhere. Global climate change is arguably the single most significant environmental issue of our time. Scientific reports indicate that global

warming will have widespread ecological consequences over the coming decades including changes in ecosystems, weather patterns and sea level rise (IPCC, 2001; Olofsson, 2007). Impacts on human society are predicted to be widespread and potentially catastrophic as water shortages (due to receding glaciers and shifting weather patterns), decreased agricultural productivity, extreme weather events (cyclones, flooding, droughts, torrential rains), and the spread of diseases (especially malaria, dengue and cholera) take their toll (IPCC, 2001).

Zambia is already dealing with the early impacts of climate change. Every year since 2000, drought and floods have taken turns in destroying the livelihood options of the rural poor whose livelihood depends on a normally predictable rainfall pattern (Zambia Vulnerability Assessment Committee, 2004). Changes in climate patterns have a negative impact on the health and nutrition status of people and agricultural production. Society at large does not appear to be deeply concerned with global warming; as a result, it is not yet acting on the ever more urgent warming emanating from the science and advocacy communities. Despite encouraging signs, ignorance, disinterest, apathy, and opposition are still prevalent.

So, clearly, there is something in which climate change is communicated that is failing to mobilize a wider audience. Simply talking about climate change in the way that has been done for the past few decades is not creating a sense of urgency or effective action. Certainly, there is an important role still for making the science of global warming accessible to the public. This function has served well in raising the issue to the high level of awareness that it already enjoys.

We believe that the characteristics of the problem itself, the way people perceive and process information, and the motivators and barriers to action need to be examined through a new lens – one that integrates multidisciplinary knowledge on communication and social change. We look at what works – and what doesn't – on the ground, in different sectors, at different levels of governance, and let these practical experiences inform our communication and social change strategies and theories.

Why is climate change not perceived as urgent?

This paper highlights some successes in communicating and action on climate change, while taking a realistic look at the challenges before us. Without doubt, global warming is a difficult topic to talk about, a tough issue to spark interest among non-experts (IPCC, 2001; Olofsson, 2007). Climate change has several characteristics that make it difficult to understand and communicate, much less perceived as urgent, as indicated in the sections which follow.

Lack of immediacy

Carbon dioxide and other greenhouse gases (GHGs) are invisible and at atmospheric concentrations (even rising ones) have no direct negative health impacts on humans as do other air pollutants. Moreover, it has taken a while (in most places) for impacts

on the environment to be detected. Many people do not connect driving their cars or flipping on a light switch with emitting CO_2 into the atmosphere. As a social problem, then, it is not visible or experienced directly in the same way that job losses, obesity, or traffic congestion are.

Remoteness of impacts

The impacts of global warming are typically perceived as remote. In many less-developed societies that are facing immediate, grave risks from disease, poverty, unsanitary conditions, warfare, and so on, global warming simply cannot compete against these direct personal threats and concerns.

Solution scepticism

The proposed solutions to solving the climate change problems also do not engender a sense of urgency. Solutions are rarely discussed in scientific presentations, leaving the audience to fill in their own (often incorrect) concepts of what those solutions might be. When they are discussed, suggestions such as reducing home energy use or using public transportation can provoke scepticism and resistance, as it is hard for individuals to see how alternatives could be made to work, or how those small actions could make any discernible difference to this global problem (Bostron, 2001).

Threats to values and self-interests

At national and international levels, solutions to global warming are seen as intensely political. Climate change remains a highly contested political issue as proposed solutions and policy mechanisms are viewed by some as conflicting with closely held values, priorities, and interests such as national sovereignty, economic growth, job security, and the general Zambian way of life which depend mainly on agriculture. As a highly contested issue with an elusive, distant payoff, tackling climate change solutions is a challenge that most politicians would rather avoid unless political gain can be granted from taking such a position (IPCC, 2001; Olofsson, 2007).

Tragedy of the commons

The problem of global warming may be the ultimate "commons" problem (NRC, 2002; Dietz, Ostrom, and Stern, 2003). The nations of the world all share one atmosphere. When GHGs are emitted from anywhere, they affect the climate of the earth as a whole. Rules about using the atmosphere for the discharge of GHGs are only slowly being defined; monitoring, accountability, and consequences for "overusing" the global atmospheric commons are extremely difficult to ensure and implement.

Political economy and injustice

The ethical implications of sharing one atmospheric commons go further. Some regions are disproportionately affected by climate change, and societal vulnerability to these negative impacts is also highly uneven due to differential levels of exposure and sensitivity to the risks, and differential ability to cope and adapt (Agyeman, Bullard, and Evans, 2003). Whether the decision is taken to maintain the status quo or undertake aggressive action to mitigate global warming, the burden and benefits of outcomes are unequally shared across nations and generations. Unfortunately, those who currently benefit from the status quo and who perceive themselves to be less severely impacted have little incentive to push for action.

Statement of a problem

The fundamental scientific consensus on human-induced climate change has become stronger (Houghton et al., 2001; Oreskes, 2004) and impacts from global warming are now being regularly documented at far-flung locations around the globe (McCarthy et al., 2001). Carbon dioxide and other heat-trapping GHGs continue to rise inexorably in the atmosphere, and people continue to lack adequate coping strategies for climate variability or change. This speaks to the magnitude of the challenge, the reality of the problem, and the lack of real progress as yet on effective solutions. Society at large does not appear to be deeply concerned with global warming, and as a result it is not yet acting on the ever more urgent warning emanating from the science and advocacy communities. Despite encouraging signs, ignorance, disinterest, apathy, and opposition are still prevalent. The resulting frustration among climate scientists and advocates runs high. They see the problem of global warming as urgent, difficult but not impossible to address, and needing immediate and substantial societal action. Yet their strategies to raise the sense of urgency in the public and among policymakers don't seem to be working – at least not fast enough. It is against this background that this study sought to investigate risk perception of climate change in Zambia and how better communication of climate change is essential in leading us out of this conundrum, out of political gridlock, pointing a path forward, and energizing leaders and the broader public to mobilize for effective action.

Justification of the study

Awareness of global warming and its causes is an important step towards undertaking remedial measures. People have to be aware of environmental problems, its consequences and eventual mitigating measures before they can engage in any conservation behaviour. Awareness of the problem should generate greater willingness to change practices in order to engender environmental improvement. They are unlikely however, to take individual action or strongly support government

policies until they view global warming as a serious risk. Well, some things are being done, but not nearly enough to be commensurate with the magnitude of the problem. Thus, a persistent conundrum and challenging opportunity emerges: while the balance of available scientific evidence conveys an increasing sense of urgency, society as a whole does not appear to view the problem as immediate, and certainly not as urgent. The often suggested remedy – by scientists and others – is the generic prescription: "better communication." Better communication is seen as essential in leading us out of this conundrum, out of political gridlock, pointing a path forward, and energizing leaders and the broader public to mobilize for effective action. Results of this study would serve to provide decision makers with a knowledge foundation upon which environmental policies, educational programmes, and communication strategies can be adequately established. It is hoped that findings and generalisations drawn from a local region could be used in other regions where people have the same plight. Furthermore, it is hoped that the recommendations suggested will be of value to authorities involved in formulating climate change policies in Zambia and elsewhere.

Research questions

The following are the questions addressed in this study:

1. Does the Zambian public perceive global warming or climatic change as a significant threat? How likely and how severe do they believe the consequences will be?
2. What affective images do Zambians have of global warming? Which of these images are the most salient?
3. What kinds of individual actions have Zambians already taken to mitigate global climate change and how common are these behaviours?
4. Do Zambians' risk perceptions of climate change influence their awareness of the degradation of the environment?
5. Do Zambians' perception of severity and barriers significantly influence their attitude and behaviour towards the degradation of the environment?
6. How best can the problem of climate change be communicated?

Research Hypothesis

The following are the hypotheses for the study:

1. Affective images of global warming influence global warming risk perceptions.
2. Perceived risks of environmental degradation factors are positively related to environmental awareness and attitude.
3. Attitude toward, and awareness of the degradation of the environment will significantly influence Zambians' environmental behaviour.
4. Respondents who perceived high levels of environmental barriers are more likely to hold negative attitudes towards environmental conservation.

Methodology

A survey instrument was constructed to measure climate change risk perceptions, Attitude, self-efficacy and environmental behaviour among Zambians. The survey instrument:

1. *Measured perceived risk of climate change using six different definitions:* (i) general concern about global warming; (ii) human fatalities; (iii) harm to natural ecosystems; (iv) present vs. future risks; (vi) likelihood of starvation, disease, decreased living standards both globally and locally (adapting likelihood measures used by O'Connor, *et al.* 1998).
2. *Measured several hypothesized predictors of risk perception such as:*
   (a) Affective imagery: Each respondent provided up to four images in response to the stimulus "global warming," using the method of continued associations (Szalay & Deese 1998; Peters & Slovic 1996). Respondents rated each image they provided on a Likert scale of extremely positive (+5) to extremely negative (-5). Affective image analysis employs a particularly structured and systematic form of word association. Issues like "global warming," and "drought," places like "hot deserts," diseases like "cancer" and names like "George Bush" and "Osama bin Laden" are provocative terms with strong positive or negative connotations for different people in different places. Affective image analysis is an innovative, simple, yet powerful technique to "map" the range, diversity, and distribution of subjective and connotative meanings within individuals, groups, and populations. Some instruments gather multiple images in addition to subjects' first answers. For example:

Q1. "What is the first word or image that comes to mind when you think of drought?"
Q2. "What is the second word or image that comes to mind when you think of drought?"

   (b) *Measured individual climate change behaviours:* A set of 24 actions that could be performed *regularly/sometimes/seldom/never/do not know* was used to measure responsible and appropriate environmental behaviour. Here the instrument was designed to identify structures of personal responsibility and value, which are individually or collectively directed towards prevention and/or resolution of environmental issues/problems. Behaviours included: using energy-efficiency as a selection criterion when buying a light bulb, household appliance, or motor vehicle; seek information to solve environmental problems, use public transport, purchasing alternative energy, lobbying policy makers, etc.
   (c) *Knowing about climate change causes and solutions:* To assess respondents' awareness of global warming in Zambia, they were asked to indicate their agreement with the knowledge of various environmental issues, e.g. which of the following is a direct cause of global warming? (i) nuclear power plants; (ii) damage to the ozone layer; (iii) burning of fossil fuels; (iv) aerosol spray cans; etc.

(d) *General environmental attitudes questions:* Environmental attitudes were measured by five item questions which were rated based on a six-point scale from 1 = *none* to 6 = *a great deal.* The attitude scale (including the cognitive and affective) was designed to measure the extent of the subjects' consciousness, beliefs, and feelings toward concern about specific environmental issues in Zambia. Specifically, how do Zambian people feel about the potential shortage of water and energy resources? Are citizens in favour of air quality and transportation control by limiting availability of privately own vehicles? Are people willing to pay for the sake of improving the environment? Can people purchase and consume resources wisely for the sake of environmental protection? Can people sacrifice their excessive demands for enjoyment by expressing their physical and ethical support for ecotourism? e.g. (i) What do you think is more important – protecting the environment, even if it costs jobs, economic growth, etc.? (ii) When you buy things at the store, do you usually think of the impact the things you buy have on the environment, etc.?

(e) *Perceived self-efficacy toward action* was measured by 15 item questions which were rated on a six-point scale ranging from 1= *not at all* to 6 = *very.* Knowledge about individuals' perceived self-efficacy is important in understanding people's beliefs about what people can do, and predicting the relevant behaviour. This section of the questionnaire was designed to induce people's beliefs about their own ability to act for the environment.

(f) *The scale of perceived barriers (both extrinsic and intrinsic) to action* was measured by 12 statements in the survey instrument to assess the extent of the subjects' reluctance to act for the environment, such as economic forces, absence of information and knowledge, etc.

Sample design

The sample size for this study was made up of students from higher learning institutes, namely: University of Zambia, Rusangu University, Charles Luangwa College of Education, Nkrumah College of Education, Chipata College of Education, Mufulira College of Education and Mongu College of Education. It was especially important for us to gather information from students who are soon to be the major leaders of society and whose environmental concern and decisions will significantly guide the future of our environment. A sample of 486 respondents was used. This was found to be adequate and manageable due to time and resource limitation. A systematic random sampling was used. This is based on the selection of elements at equal intervals, starting with a randomly selected element on the population list. So the members of the population have to be numbered first. For example, to select ten elements from a population of 100, the length of intervals 'K' is determined as:

$$K = \frac{100}{10} = \text{i.e. } \frac{\text{Size of population}}{\text{Size of Sample}}$$

So the tenth from the sample would be numbers 10, 20, 30, 40, 50, 60, 70, 80, 90, 100.

Processing and analysis of data

The processing of the data began shortly after questionnaires were received from the field. Data were coded and entered in a sequential manner using a relational database engine developed using Microsoft Access. Analysis of data was completed using SPSS software version 16.

Exploratory factor analysis

Exploratory factor analysis was conducted on the data to extract the items that are loaded on each construct. Exploratory factor analysis was conducted on the occurrence responses of each latent construct using the SAS software system (Hatcher, 1994). Each set of items defining a particular construct was submitted separately to the exploratory factor analysis. The SCREE was used to determine the number of meaningful factors retained for interpretation, and an orthogonal Varimax rotation, which attempts to minimize the number of variables that have high loadings on each factor, was used. A reliability assessment (Cronbach's alpha α) was used to check for internal consistency of each factor. A reliability calculation was done by using Cronbach Alpha (α) to produce a test of homogeneity (Gorge & Mallery, 2001). In this study, Alpha values for clusters of the items and/or the scale were set at the level of not less than 0.60.

Causal effects of awareness and attitude on environmental behaviour were investigated. For all covariates with ordinal or ratio level data, linear regressions were run with the interpretive predictors of environmental awareness and attitude as independent variables. The standardized regression coefficients *(β)* and *p* values are reported. Beta (β) is a standardized score, which allows for direct comparisons of the relative strengths of relationships between variables. *P* is a standardized measure of statistical significance and identifies the likelihood that a particular outcome may have occurred by chance (Gorge & Mallery, 2001).

Validity and reliability of the instrument

The questionnaires were field pretested with 40 students. This was done to test the comprehension, phrasing, sensitivity and length of the questionnaire. The Cronbach's alpha was calculated to test the consistency of each construct.

Results

Zambian Images of Global Warming

A summary of the results indicate that there were many categories in which Zambians associate global warming. The number of different categories indicates that global warming was a richly meaningful term, evoking many different connotations. The

sample had a relatively strong negative affect associated with global warming. Overall, the mean image affect for the most salient image association of global warming was – 4.60 (SD = 4.36); demonstrating that global warming has primarily negative connotations for Zambians.

Associations to drought (Affect mean = -4.71; SD = 2.83) was the most dominant category. Examples include "water shortages", "too dry", "no drinking water", "dry rivers", "unreliable rainfall". Associations to food shortages (Affect mean = - 3. 72; SD = 3.93) were the second most dominant category. Examples include "decreased agricultural productivity", "food insecurity", "hunger".

The third most dominant category comprised heat and rising temperatures (Affect mean = -2.11; SD = 3.67). Examples include "temperature changes", "heat,," "hot".

The fourth dominant category was associated with general disaster (Affect mean -4.11; SD = 3.19). Examples include "death", "the end of the world", "cyclones".

The fifth most dominant category was associated with impacts on non-human nature, which included ecosystems and different species (Affect mean = -2.97; SD = 3.09). Examples include "damage to the environment", "animals and their habitat destroyed".

The sixth category comprised disease and human health (Affect mean = - 1.91; SD = 2.11). Examples include "malaria", "cholera", and "malnutrition".

The seventh category was associated with religion (Affect mean = -0.81; SD = 1.11). Examples include "it is God's will", "cannot do anything, God has decided".

The eighth category comprised associations to general changes in the climate system (Affect mean = -0.68; SD = 1.37). Examples include "seasonal shifts", "short summers causing crop failure", "long and severe winters".

Finally, the ninth category was associated with floods (Affect mean = -0.47; SD = 0.59). Examples include "torrential rain", "poor drainage", "river bank bursts".

Zambians' environmental risk perceptions

According to Table 1, most respondents (87%) agreed or strongly agreed that droughts would increase due to global warming, that there would be starvation due to global warming (83%), and that many peoples' living standards would decrease due to global warming (81%). Respondents, in general, agreed that the environment was in danger due to climate change (79%), that deforestation could contribute to the process of climate change (71%), and that non-human nature including ecosystems and species would be negatively affected by global warming.

Table 1: Factor Loadings on environmental risk perception factor

Indicator	Factor loading	Cronbach's alpha
Risk perception		0.84
Diseases will increase due to global warming	0.71	
My standard of life will decrease due climate change	0.91	
Water shortages will occur where I live	0.86	
Non-human nature will be affected due to climate change	0.67	
Environment is in danger due to global warming	0.78	
I will suffer from starvation due to climate change	0.91	
Serious global warming impacts in the world	0.68	

Exploratory factor analysis was used to extract the most important items defining the severity factor. This factor mainly reflects the perception of the damages caused by climate change at local and international level. The reliability of coefficient for this factor is $\alpha = 0.84$ indicating a relatively good internal consistency (Table 1).

Respondents' awareness of global warming or climate change

To assess respondents' awareness of global warming in Zambia, they were asked to indicate their agreement with the knowledge of various environmental issues. The results show that, in general, respondents agreed that they are aware of climate change in Zambia. Most respondents (87.8%) agreed or strongly agreed that they were aware of climate change problems in Zambia; that they were aware of climate change problems in the region (78.5%) and that they were aware of the effects of climate change in their area (91%). Respondents who indicated little or no awareness of environmental degradation at national level and local levels represented 9% of the surveyed sample. Although a majority of people perceived climate change problems at the various scales of influence, about 4% of the respondents seemed to disagree that they experienced climate change effects in their area. Respondents, in general, agreed that they were aware that burning of fossil fuels can cause global warming (74.5%), that aerosol spray cans could cause global warming (83.4%), that climate change reduces plot yields (88.7%), and that crops grown depended on climatic conditions (98.5%). Respondents had the view that tree cutting was responsible for climate change (89.1%), and that farming practices in Zambia increased land degradation (85.4%). These findings suggest that respondents had a sound understanding of environmental degradation.

Table 2: Awareness Factor with Varimax rotated factor loadings

Indicator	Factor loading	Cronbach's alpha
Awareness		0.86
I am aware of effects of climate change in Zambia	0.83	
I am aware of effects of climate change in my area	0.87	
I am aware that nuclear power plants cause global warming	0.68	
I am aware that burning of fossil fuels cause global warming	0.67	
I am aware that aerosol spray cans cause global warming	0.59	
Deforestation can contribute to climate change	0.71	
Crops grown in Zambia depend on climatic conditions	0.91	

The scales of these variables demonstrate a high level of reliability with an estimate of $\alpha = 0.86$. Questions that heavily load on the awareness factor covered a large range of issues. The items of the awareness factor are related to knowledge of the existence of climate change effects at national and local levels. Two of the variables capture the impact of climate change on water availability and crop yields. From the exploratory factor results in Table 2, items directly related to activities on the local level have the highest loadings on the awareness factor.

Respondents' attitude toward the environment

Questions included in this study were to elicit respondents' opinions regarding the linkages between climate change and food, water, and health problems; the responsibility of various actors for the climate change process, and their willingness to participate in environmental improvement. The results show that 89.6 percent of the respondents believed that the environment in Zambia was in danger of climate change, 44% strongly agreed that the environment was in danger, and 20.2% simply agreed with the statement. About 10% of the respondents did not think that climate change put the environment in great danger. Most respondents (90%) believed that deforestation caused climate change problems.

Further, with respect to the linkages between climate change and other issues, all respondents agreed that climate change caused food shortages in Zambia; that it caused water shortages (89.4%), and played a significant role in disease infection in the communities (61.5%). Most respondents (77.5%) believed that developed countries were highly responsible for global warming problems. The majority (81%) also agreed that every citizen was responsible for climate change, and that the government had a role in the problem (82%).

Improvement of the environment requires investments from different actors including the government and Zambians themselves. For people to invest in the amelioration of the environment, not only do they need to have the economic means, but they also must be willing to do so. Respondents were asked a set of questions in order to assess their willingness to participate in the improvement of the environment. About 81% of the respondents agreed they were willing to

participate in the improvement of the environment. However, 62% of them did not think that Zambia had the means to improve the environment and that they were not willing to contribute financially towards this activity (91%). The items dealing with environmental attitudes in the questionnaire were subjected to a Varimax rotation factor analysis. Out of the nine items, five have loadings greater than 0.40 and were retained for further analysis (see Table 3)

Table 3: Attitude factor with Varimax rotated loadings

Item	Factor loading	Cronbach's alpha
Attitude		0.76
Developed countries are responsible for global warming	0.71	
Every citizen is responsible for climate change	0.68	
Governments have a role in solving environmental problems	0.85	
Increase in taxes if used to prevent global warming	0.48	
Protect the environment at the expense of economic development	0.76	

The items mainly reflected the global effects of climate change and the individuals' responsibility in the process. The factors seem to have a relatively good reliability. The coefficient alpha was $\alpha = 0.76$.

Respondents' environmental self-efficacy

Respondents expressed their opinions regarding their capacity to influence decision makers, and their ability to intervene at national level to improve the environment in Zambia. The results show a sense of respondents' incapacity to act beyond their community. Only 11% of respondents believed they are capable of reducing environmental degradation at national level. Respondents, however, did not understand how their involvement in conservation practices might reduce environmental degradation in the country. Nevertheless, 33% of respondents thought they could influence decision makers to take actions to improve the environment.

Table 4: Self-efficacy factor loadings

Item	Factor loading	Cronbach's alpha
Efficacy		0.63
My own actions could have an effect on the environment	0.84	
I could influence the solution to specific environmental issues	0.63	
My ability to reduce environmental degradation in my area	0.79	
I could commit time to influence water and energy conservation	0.63	
I could commit time to influence transport and air quality control	0.69	
My ability to reduce environmental degradation at national level	0.48	

Out of the nine items, six have loadings greater than 0.40 and were retained for further analysis (see Table 4). The first three self-efficacy factors deal with respondents' ability to reduce environmental degradation at local levels. The last part deals with respondents' capacity to reduce environmental degradation at the national level. The factor has a poor internal consistency with a reliability coefficient of 0.63. This suggests that Zambians feel greater capability to act locally rather than at national and global levels.

Respondents' environmental behaviour

To assess individuals' environmental behaviour, a number of items were included in the questionnaire that inquired about the extent to which respondents engaged in certain behaviours. Of respondents interviewed, 86% agreed that conservation of the environment was the best way to guarantee their survival. Among those who agreed with this statement, 81% strongly agreed. Further, 87% felt that it was their responsibility to encourage their peers to adopt environmental conservation techniques. The results suggest that respondents understood the need for necessary collective action on the part of all individuals to improve the environment. The respondents' opinions on their financial effort to protect the environment were weaker than other cases. Of respondents interviewed, 9% agreed that they have made financial decisions to protect the environment. The results also show that 91% of respondents declared they did not make financial investments to improve the environment.

Table 5: Perceived behaviour factor loadings

Indicator	Factor loading	Cronbach's alpha
Behaviour		0.74
It is my responsibility to encourage others to conserve nature	0.73	
Seek information to solve environmental problems	0.45	
Purchase an energy efficient car and appliances	0.68	
Plant and care for trees	0.58	
Purchase the ozone-safe products	0.73	
Prepared to pay for the sake of the environment	0.47	
Use public transport	0.84	

Table 5 reports the items that have loadings greater than 0.40 on the behavioural construct. The items highly load on the behaviour factor. All the items but three had loadings greater than 0.70. The seven items together had a coefficient of reliability of $\alpha = 0.74$, indicating a reasonable internal consistency.

Respondents' perceived barrier factor

The results show that 90% of respondents agreed with the statements that they did not take actions to ameliorate their environment; that environmentally safe/friendly

alternatives for many of the products they want to buy were just too expensive (89%). Further the results show that 91% of respondents were not willing to pay for the sake of the environment, that they perceived themselves not having enough information on global warming (89%), that they could not solve environmental problem on their own (86%), and that there was no channel accessible for taking environmental problems (79%). Factor analysis suggests six items that measure perceived barriers to environmental improvement.

Table 6: Perceived barrier loadings

Item	Factor loading	Cronbach's alpha
Barrier		0.84
Environmentally safe alternative products are expensive	0.74	
I didn't feel I could solve environmental problems alone	0.67	
I didn't think it is worth scarifying for environment protection	0.83	
I didn't perceive myself having enough information about warming	0.91	
Acting for the environment is not of interest at all to me	0.65	
There is no channel accessible for taking environmental issues	0.59	

These items have high loadings on the perceived barrier factor. The coefficient alpha was $\alpha = 0.84$ for all six items (Table 6). Based on the coefficients, the scale measuring the items is reliable.

Influence of perceived risks of environmental degradation factors on awareness

The role of risk perception of the susceptibility toward the problem, its perceived severity, the social and technical barriers, and the benefit of environmental improvement in raising public awareness were examined. The results show that among the belief factors, only risk perception of severity of the degradation of the environment was found to cause awareness of the problems. Results in Table 7 show a positive and significant relationship between perceived severity and awareness of environmental degradation ($\beta = 0.56$, $p < .001$).

Table 7: Predictors of environmental awarene ss

Variable	Coefficient
Perceived susceptibility	0.29
Perceived risks (severity)	0.56*
Perceived barriers	- 0.51*
Perceived benefits	0.17
R^2	**0.42**

**Significant at* $\alpha = 0.001$

These findings support the hypothesis that perception of severity of the degradation of the environment was positively and significantly related to awareness. The results indicate that greater perception of the severity of climate change problems caused respondents to be more aware of the degradation of the environment. Perceived susceptibility with coefficient of 0.29 and perceived benefit factor with coefficient of 0.17 were positively related to awareness, whilst perceived barrier factor had a negative relationship (- 0.51). These coefficients were significant at 99% level of significance.

Influence of perceived environmental degradation factors on attitude

The results show that three of the four factors were significantly related to attitude toward the environment. The perception of susceptibility was positively related to attitude toward the environment ($\beta = 0.51$, $p < .001$). The results suggest that Zambians who felt more susceptible to environmental degradation are more likely to develop a positive attitude towards the environment (Table 8).

Table 8: Predictors of environmental attitude

Variable	Coefficient
Perceived Susceptibility	0.51*
Perceived Risks (Severity)	0.26*
Perceived Barriers	- 0.48*
Perceived Benefits	0.29*
R^2	**0.66**

**Significant at* $\alpha = 0.001$

The perceived severity risk factor was positively related to the attitude variable ($\beta = 0.26$, $p < .005$). Increasing severity of environmental degradation tends to promote a positive attitude of Zambians towards the environment. Perceived benefits of environmental improvements had also a positive relationship with attitude ($\beta = 0.29$, $p < .001$). Perception of the benefits of an improved environment seemed to play a significant role in influencing respondents' attitude toward environmental degradation. Although attitude may not lead to actual behaviour, the results indicate that respondents are more likely to develop a positive attitude toward the environment if they perceive a greater benefit from an improved environment.

Influence of attitude and awareness on behaviour

This section examined the role played by individuals' beliefs about the environment on their behaviour. It was hypothesised that a set of Zambians' beliefs about the degradation of the environment would be significantly related to their awareness of the situation and their attitude toward it. Attitude and awareness would in turn have

a significant relationship with respondents' environmental behaviour. Therefore, it is assumed that attitude and awareness would play a mediating role between respondents' environmental beliefs and their behaviour.

Table 9: Influence of awareness and attitude on environmental behaviour

Variable	Coefficient
Awareness	0.39*
Attitude	0.11
R^2	**0.39**

* Significant at $\alpha = 0.001$

Table 9 shows that awareness of the degradation of the environment has a positive influence on respondents' self-reported behaviour ($\beta = 0.39$, $p < .001$). The results support the hypothesis that greater awareness of the degradation of the environment leads to a more positive environmental behaviour.

Influence of barriers on attitudes towards environmental conservation

This section assessed the extent of the subjects' reluctance to act for the environment, such as economic forces, absence of information, and knowledge. The results show that perceived environmental barriers have a negative causal effect on attitude ($\beta = - 0.48$, $p < .001$), supporting the hypothesis that respondents who perceived high levels of environmental barriers are more likely to hold negative attitudes towards environment conservation (see Table 8).

Discussion

Awareness of the degradation of the environment

Descriptive statistical analysis of the scale responses showed that respondents in the study area demonstrated an awareness of the degradation of the environment. Consistent with other studies (Loomis & Helfand, 2003; Nickerson, 2003), respondents generally agreed that they were more aware of environmental degradation at the local than at national or international levels. They felt stronger about issues involving their nearness to the environment than those focusing on macro levels. The perception of severity internalised might improve their awareness of the problems, which could lead to a more positive environmental behaviour. A recent study conducted by Eurobarometer (2008) revealed that concrete experiences of environmental problems appear to imply a more environmental awareness, a higher support for the environmental protection and a higher likelihood of taking actions in order to protect the environment. These findings imply that

policymakers need to develop strategies to point out the importance of the severity of other environmental problems such as global warming and climate change which are not seen to be of immediate concern by the population. In this case, not only is it important to stress the extensiveness of environmental damages, but also the consequences of not taking appropriate and immediate actions to stem the process of environmental degradation.

Relationships among a set of environmental beliefs and awareness of, and attitude towards environmental conservation

The study also tested five hypotheses to establish the relationships between the set of environmental beliefs (perceived risks, severity, and barriers) and awareness of, and attitude towards environmental conservation. Causal effects of awareness and attitude on environmental behaviour were also investigated. The results show that perception of the severity of environmental degradation appeared to play a significant role in raising Zambians' awareness and shaping their attitude. Perception of the severity of environmental degradation had a positive influence on both awareness of, and attitude toward environmental degradation. Perception of susceptibility and benefits significantly influence Zambians' attitude toward environmental degradation. The results are similar to those of previous research which indicated that people who find environmental protection very important are more informed about environmental issues, have personal experiences of environmental problems, and are more likely to make environmentally friendly choices (Ziervogel & Taylor 2008). According to Hawthorne and Alabaster (1999), awareness of environmental degradation is a significant precursor of environmental self-efficacy and behaviour. Greater awareness of environmental degradation enhances peoples' capacity in making decisions to improve the situation. Greater environmental awareness leads to greater involvement in environmental management programs. Respondents' environmental self-efficacy also plays a significant role in their decision to change their behaviour. Greater perception of one's capability to improve the environment is significantly associated with a more positive environmental behaviour. Consistent with other studies (Gowdy 2005; O'Brien 2002; Hawthorne & Alabaster 1999), people must have a clear consciousness of the problems before they can take decisions to act.

The findings support the hypothesis that perception of severity of the degradation of the environment was positively and significantly related to awareness. Vezzoli and Manzini (2008) observed that pro-environmental behaviour becomes more probable when an individual is aware of harmful consequences to others from a state of the environment and when those persons ascribe responsibility to themselves for changing the offensive environmental damage.

Awareness of the degradation of the environment has a positive influence on respondents' self-reported behaviour. The results support the hypothesis that greater awareness of the degradation of the environment leads to a more positive environmental behaviour. Consistent with other studies (Vezzoli & Manzini 2008),

the more the individuals are aware of the existence of the degradation of the environment and of its consequences, the more likely they are to do something about it in order to ameliorate the situation. The results of the present study suggest that behavioural change is a process. This is especially true for environmental problems which generally have direct impacts and cause significant externalities. Before individuals can take a given measure to limit the effects of climate change for instance, they have to be conscious of the problems.

Education and communication strategies

Overall, the findings of this study help explain the paradox in Zambian risk perceptions of global warming. While a large majority of Zambians believe global warming is real and consider it a serious problem, global warming remains a low priority relative to other national and environmental issues. In other words, global warming currently lacks a sense of urgency. Most of the Zambian public considers global warming a moderate risk that is more likely to impact people and places far distant in space and time. These findings suggest that multiple communication strategies are needed.

Strategy 1: Highlight potential local and regional climate change impacts.

Local threats are generally perceived as more salient and of greater urgency than global problems. This suggests that it is critical that efforts are made to describe the potential local, national and regional impacts of climate change and communicate these potential impacts to the public.

Strategy 2: Climate change is happening now

Immediate threats are generally perceived as more salient and greater urgency than future problems. This suggests that educators and communicators should highlight the current impacts of climate change around the world, which in some places are already profound. What is needed now are concrete details, images, and stories of climate change impacts on people, places, economies, cultures, and ecosystems to bring the issue to life, and to help people understand the potential dangers for the rest of the world. In short, educators and communicators need to make global climate change local and to discuss climate change in the present, as well as the future.

Strategy 3: Highlight the potential impacts of climate change on human health and extreme weather events

This research found that the Zambian public does not currently associate global warming with any impacts on human health. Communicators need to articulate

and emphasize these impacts, which are among the most serious consequences of projected climate change. An emphasis on the projected impacts on human health is also likely to elevate public concerns about global warming.

Strategy 4: Careful choice of messengers

The selection of climate change communicators is very important. Just because a government official or scientist knows "the issue" about climate change and can articulate them does not mean they can communicate effectively to a concerned public. The wrong framing, word, or phrase in a public meeting can generate the opposite effect from that which you are seeking and lead to hostility being directed at you or your organization. Communicators should understand the socio-cultural values of the stakeholders, be able to communicate sensitive information effectively, not take criticism personally or push back when challenged and, in general, be able to engage in an open and equal dialogue with stakeholders.

Conclusion

Natural scientists warn that global climate change is a very serious risk with potentially devastating consequences for human societies and natural ecosystems around the world. This paper gives examples and challenges that have worked in preventing audiences from getting bogged down in these characteristics of climate change problems in different settings. This research found that a clear majority of respondents expressed concern about climate change and global warming. While 86% of respondents said they were ready to buy ecologically friendly products even if they are more expensive, only 13% had actually done so during the period of this survey. Only 4% of respondents had purchased energy from an alternative source, such as wind or solar power, and only 6% of respondents who drive reported using alternative transportation instead of driving. The fundamental claim of this paper is that better environmental information dissemination, more environmental knowledge, or more environmental communication alone will not necessarily lead to desirable environmental behaviour. While it is strongly believed that better understanding has an important role to play, environmental knowledge that does not keep barriers to behaviour and social change in mind is unlikely to be effective or sufficient. More importantly, in this study, although it is noted that knowledge of the environmental problem is a prerequisite for appropriate environmental behaviour, abilities alone, such as awareness, knowledge, skills, and others are not sufficient to guide one's actions, unless an individual possesses a desire to act. Respondents who perceived high levels of environmental barriers are more likely to hold negative attitudes towards environment conservation. Perceived barriers have a negative causal effect on attitude towards environmental conservation. Successful environmental policies that mobilizes action on climate change, therefore, must take into account the options that people have for action and their social and cognitive

characteristics. In other words, what can they effectively do with the information they are given? Global environmental politics will only fulfil its tasks if the decision makers in the individual nations are supported by a population whose environmental awareness and willingness to behave in an environmentally appropriate way permits them to demand and assert the solutions to global environmental problems

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